MEMORANDUM

TO: Traffic Engineering Staff

FROM: Jack Lucero Fleck
City Traffic Engineer

DATE: May 6, 2009

SUBJECT: Pedestrian Signal Guidelines

This memo provides guidelines for design and installation of pedestrian countdown signals, Accessible Pedestrian Signals (APS), pedestrian actuation, and pedestrian signal timing. These guidelines document desired practice, subject to engineering judgment on a case-by-case basis. They are not meant to supplant standards from the CA MUTCD. Practitioners involved in signal design and construction should consult both documents.

Among key points, these guidelines recommend:

1. Pedestrian countdown signals should be installed at all intersections with traffic signals.
2. Locations with existing traffic signals that lack pedestrian signals should be prioritized for pedestrian signal installation.
3. With few exceptions, APS should be provided along with pedestrian countdown signals. New installations are prioritized using the SFMTA APS prioritization tool.
4. Pedestrian crossing times should be guided by:
    - a walking speed of 3.5 feet per second for the pedestrian clearance interval; and
    - a walking speed of 2.5 feet per second for the total pedestrian crossing time;
5. Special pedestrian signal phases or timing may be used where appropriate to improve safety and traffic flow.

The guidelines were developed by the SFMTA Pedestrian Program and adopted by the Signal Review Committee of SFMTA Traffic Engineering on March 27, 2009.

I. PEDESTRIAN COUNTDOWN SIGNAL INSTALLATION

Pedestrian countdown signals should be installed at all intersections with traffic signals. Locations with existing traffic signals that lack pedestrian signals should be prioritized for pedestrian signal installation. Pedestrian signal heads and mountings should conform to the Caltrans Standard Specifications.

A. Pedestrian Countdown Signal Installation with New Traffic Signal Construction

In San Francisco, pedestrian signals should be included in the construction of all new traffic signals.

B. Pedestrian Countdown Signal Installation on Existing Traffic Signals

In San Francisco, the following factors are used to prioritize locations for installation of pedestrian countdown signals where not currently present:

1. Pedestrian collision history over the last five years.
2. Presence of designated school (yellow) crosswalks.
3. Volume of past requests for pedestrian signals.
4. Absence of pedestrian countdowns crossing a major street crossing.
5. Whether the intersection is in a commercial district or not, which is typically a good indication of higher pedestrian activity.
6. Condition of conduits, which determines easy of upgrade. The determination of whether an intersection has conduits in good condition is based on knowledge of recent signal contracts in immediate area and age of existing equipment.
7. Pattern of existing pedestrian signals at adjacent to signalized intersections.

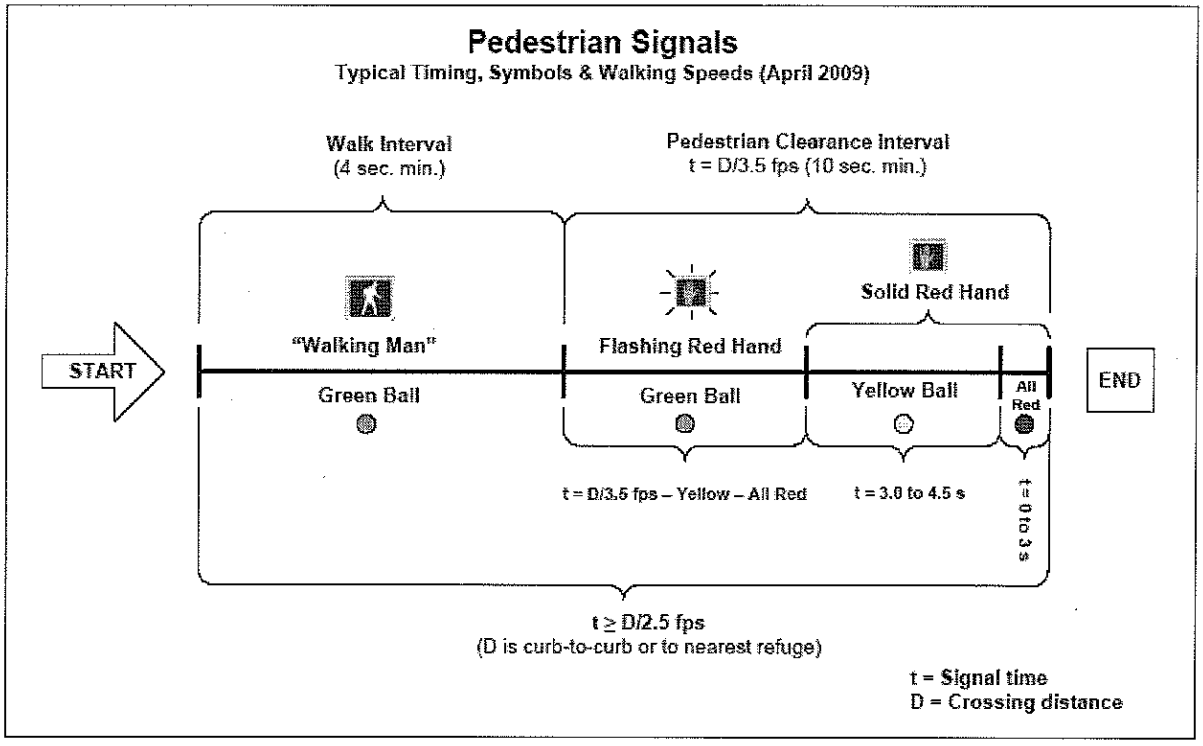
II. PEDESTRIAN SIGNAL TIMING

A. Pedestrian Clearance Interval

The pedestrian clearance interval includes the flashing red hand, yellow and any all-red phases. The clearance interval should be a minimum of 10 seconds from the beginning of the countdown display until the cross traffic receives a green signal indication. The duration of the flashing red hand is calculated by dividing the crossing distance (curb to curb in feet) by the walking speed (3.5 feet/second) and then subtracting the yellow and any all-red phases. For pedestrian movements that have no concurrent vehicular phase, the flashing red hand should be followed by a 2 to 4 second all-red phase prior to the start of cross street green.

The current walking speed guideline in the CA MUTCD is 4 feet per second. San Francisco has decided to exceed these standards and adopt a slower walking speed of 3.5 feet per second, based on research that suggests such a speed will

accommodate a larger percentage of pedestrians. At some intersections where implementing the new 3.5 feet per second walking speed may require significant system changes, such as changing the cycle length of a system due to insufficient time in the cycle, implementation of the 3.5 feet per second timing can be delayed to a time when the greater system can be adjusted. Otherwise the 3.5 feet per second walking speed should be implemented with any signal timing split or phasing change and noted in order to track which locations have been modified.



B. Total Pedestrian Crossing Time

The total crossing time, including the WALK, flashing red hand, yellow and all-red, should be sufficient to allow a pedestrian to travel from curb to curb or from curb to nearest refuge (raised median or island) at a rate of 2.5 feet per second. In rare circumstances due to intersection or operational constraints, a rate between 2.5 and 3.0 feet per second can be considered acceptable. The nearest refuge for signal timing calculations should be at least 6 feet wide but can be as narrow as 4 feet wide in limited applications.

At locations where the pedestrian clearance interval and total crossing time guidelines have been met, but have not resolved concerns with there being sufficient time to cross the street, improvements such as curb extensions, median islands or alternative signal treatments should be considered.

III. ACCESSIBLE PEDESTRIAN SIGNALS

An Accessible Pedestrian Signal (APS) is a pedestrian pushbutton that communicates when to cross the street in a non-visual manner, such as audible tones, speech messages and vibrating surfaces. APS are intended to aid the visually impaired in crossing at signalized intersections. They are particularly useful where high traffic volumes, left turn phasing, exclusive pedestrian phases, complex geometry, and/or wide streets make it hard for visually impaired pedestrians to use traffic noise patterns to guide their crossing behavior.

San Francisco has developed a Request and Installation Policy, a Prioritization Tool and Technical Specifications to guide the City's APS program. The Request and Installation Policy includes information on how to request APS at an intersection, how requests will be prioritized, the design and installation of APS and how troubleshooting and vandalism are handled. The Prioritization Tool is a mechanism for scoring and prioritizing requested intersections. The SFMTA will allocate a minimum of 15 percent of its approved funding for installation of new traffic signals and traffic signal upgrades for ADA improvements such as APS and curb ramps.

IV. PEDESTRIAN ACTUATION

In most cases, pedestrian phases should be displayed automatically, without requiring pedestrian pushbuttons or other actuation. A few exceptions may apply, however:

- ***Intersections on state routes:*** Caltrans requires that new signals on state routes be fully-actuated.
- ***Intersections on transit priority corridors:*** Transit priority corridors, such as 3rd Street, can feature pedestrian pushbuttons and vehicular actuation to minimize red light stopping delay to transit.
- ***To improve pedestrian circulation and safety:*** Where conflicting volumes are high, pedestrian pushbuttons can be used to maintain a crosswalk open, create a protected pedestrian crossing, or to re-open a closed crosswalk.
- ***Low traffic volume cross streets to major roadways:*** Pedestrian pushbuttons can minimize the impacts of new traffic signals on major streets and thus can facilitate installation of new signals where traffic and pedestrian volumes on the cross street are light.
- ***Mid-block crossings***: Pedestrian pushbuttons can facilitate installation of new pedestrian-only mid-block signals where there may be a need to provide an additional connection between signalized intersections.

Pedestrian pushbuttons should be compliant with ADA standards, as provided in Caltrans standard plans and specifications and the CA MUTCD. For a crosswalk that

uses pedestrian pushbuttons where pedestrians will need to wait at a pedestrian refuge, pedestrian pushbuttons must be provided on such refuge.

V. SPECIAL PEDESTRIAN PHASES

A. Leading Pedestrian Interval

Leading pedestrian interval (LPI, or "pedestrian head start") timing at a signalized intersection releases pedestrians three to five seconds before any conflicting autos receive the green. Thus, pedestrians are given a head start to establish their right-of-way in the intersection, making drivers of turning vehicles much more likely to yield.

Pedestrian head starts are particularly useful at intersections with heavy turn volumes (at least 300 turning vehicles per peak hour over the crosswalk in question) and moderate to heavy pedestrian volumes (at least 200 pedestrians per peak hour in the particular crosswalk). Crosswalks intersected by dual right or left turn lanes are particularly good locations.

From an operational standpoint, the additional pedestrian exclusive time of an LPI (taken from turning vehicles) can reduce the effective vehicle capacity of the intersection. If these turns are the critical volumes that determine how close the intersection operates to capacity and location has been operating safely, pedestrian head start timing may not be recommended.

B. Pedestrian-Only Phase

A pedestrian-only phase (or pedestrian scramble) provides an exclusive pedestrian phase to allow pedestrians to cross at a signalized intersection in all directions at the same time while vehicles are stopped on all approaches. The primary advantage of the scramble phase is that pedestrians can cross the intersection without any conflicting motor vehicle movements. Depending upon the individual intersection characteristics, pedestrians may also be able to cross the intersection diagonally, essentially completing two crossings in one movement.

Pedestrian scrambles are generally most applicable where pedestrian crossing distances are short, pedestrian volumes are high, and pedestrian movements are not predominantly linear. They have been found to reduce crashes where pedestrian and vehicle volumes are high, and are especially effective at improving safety at intersections with conflicts between turning vehicles and pedestrians.

While they can offer safety benefits, pedestrian scrambles do not universally improve conditions for pedestrians and/or motorists. From the pedestrian perspective, potential disadvantages of pedestrian scrambles include:

- Increased delay for pedestrians who only want to cross one leg of the intersection;

- Increased crowding for pedestrians at intersection corners as they await the pedestrian signal phase; and

- Difficulties for visually impaired pedestrians who use the sound of traffic as a cue to guide themselves when and where to cross an intersection.

Likewise, pedestrian scrambles can present operational challenges with respect to vehicle delay (including transit), queue lengths, and overall intersection vehicle capacity:

- Adding a scramble phase will reduce the amount of green time given to vehicles on both streets, leading to delay and queuing if vehicle traffic volumes are too high;

- If turning demand is much higher than one or two vehicles per cycle, added delay from the pedestrian scramble may cause a queue of turning vehicles that could disrupt through traffic; and

- Delays to through traffic can also result if a scramble phase requires adoption of a longer cycle length, causing breaks in the surrounding signal system and poor signal progression.

For these reasons, the introduction of pedestrian scramble phases must be considered carefully, and monitored and assessed after implementation.

JLF:CCO